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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Dong-Woo Sohn

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EXAMINER

CHEN, JACK S J

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 05/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/749,775		SIHN ET AL.	
	Examiner		Art Unit	
	Jack Chen		2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 5-9 and 12-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 10 and 11 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>3/25/05</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

1. Applicant's election without traverse of the invention of group I, species I, with claims 1-11 indicated by Applicant to read thereon, in the reply filed on 8 February 2006 is acknowledged.

While Examiner acknowledges that Applicant indicated that claims 5-6 and 7-9 read on the elected species I, claims 5-6 are drawn to non-elected species II and are hereby withdrawn from further consideration therefor. Similarly, claims 7-9 are drawn to non-elected species III and are hereby withdrawn from further consideration.

2. Claims 5-9 and 12-28 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

The information disclosure statement filed on March 25, 2005 has been considered.

Oath/Declaration

Oath/Declaration filed on December 30, 2003 has been considered.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-4 and 10-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 1, the phrase "**predetermined** first doping concentration" is unclear and indefinite. The use of "predetermined" in claim reads on a nebulous mental step conducted prior to the manipulative steps of the claimed process, hence rendering the present process claim unclear in meaning in scope. If applicant wishes to patent detail controls over the recited process, then the process steps must be positively recited. See *Seagram & Sons Inc. vs. Marshall*, 84 USPQ 180.

Re claim 1, the phrase “**predetermined** concentration” is unclear and indefinite. The use of “predetermined” in claim reads on a nebulous mental step conducted prior to the manipulative steps of the claimed process, hence rendering the present process claim unclear in meaning in scope. If applicant wishes to patent detail controls over the recited process, then the process steps must be positively recited. See *Seagram & Sons Inc. vs. Marshall*, 84 USPQ 180.

Re claim 2, the phrase “the first impurity” lacks antecedent basis.

Re claim 2, the phrase “the second impurity” lacks antecedent basis.

Re claim 4, the phrase “for about 2 minutes and about 5 minutes” is unclear.

The remaining claims 3 and 10-11 are rejected for depending from the above rejected claims.

For the purpose of patentability, these claims will be interpreted as best understood.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-2 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto, US Pub. No. 2001/0030336 A1 in view of Thakur, US/6,255,159 B1.

Yamamoto discloses a method for forming a storage node of a capacitor, which comprises forming a first amorphous silicon layer 7 (fig. 2A) doped with an impurity in a predetermined first doping concentration (i.e., $1E20$, paragraph 52, such concentration is within the range of Applicant's claimed invention, see claim 2; such concentration will inherently suppress dopants from locally agglomerating) suppressing dopants from locally agglomerating; forming an impurity undoped second amorphous silicon layer 16 on the first amorphous silicon layer (fig. 2A, paragraph 52); forming a storage node by patterning the first amorphous silicon layer and the second amorphous silicon layer (fig. 2A, paragraph 52); forming silicon grains 11 (i.e., HSG) on a surface of the storage node (fig. 2B, paragraph 54-55); and doping the impurity (fig. 2C, paragraph 56) to the storage node and the silicon grains until reaching a second predetermined concentration for providing conductivity required by the storage node, see figs. 1A-5B and page 1-5 for more details.

Yamamoto disclosed in above, however, Yamamoto is silent to forming an impurity undoped second amorphous silicon layer on the first amorphous silicon layer in an in-situ condition.

Thakur teaches a method for forming a storage node of a capacitor, which comprises forming a first amorphous silicon layer 106 (fig. 1C) doped with an impurity in a predetermined first doping concentration; forming an impurity undoped second amorphous silicon layer 108

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(fig. 1D) on the first amorphous silicon layer in an in-situ condition (Re the term "in-situ" see col. 4, lines 35-40; furthermore, forming the layers under the in-situ condition is well known in the semiconductor art); forming a storage node by patterning the first amorphous silicon layer and the second amorphous silicon layer (fig. 1E); cleaning the surface of the storage node with HF (Re claims 10-11, col. 4, line 63 to col. 5, line 2); forming silicon grains (i.e., HSG) on a surface of the storage node (fig. 1H), see figs. 1A-4F and cols. 1-12 for more details.

Therefore, the subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to form the amorphous layers under the in-situ condition as taught by Thakur in the method of Yamamoto in order to prevent oxidation between layers, etc. And further cleaning the surface of the storage node with HF as taught by Thakur in the method of Yamamoto in order to promote enhanced HSG formation.

Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Yamamoto by selecting the suitable concentration for the second impurity, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

8. Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto, US Pub. No. 2001/0030336 A1 in view of Thakur, US/6,255,159 B1 as applied to claims 1-2 and 10-11 above, and further in view of Lee et al., US/6,218,260 B1.

Yamamoto and Thakur disclosed in above; however, both of them are silent to using plasma doping for introducing impurity into the storage node (HSG).

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Lee et al. teaches a method for forming the similar device, which comprises forming storage node having HSG 21 (fig. 1B) on a substrate; and using plasma doping 1f (fig. 1A) method for introducing phosphorus (using PH₃ as the source) into the storage node (fig. 8, col. 9, lines 8-33), see figs. 1A-12 and cols. 1-16 for more details.

With respect to claim 4, the claimed ranges of temperature, pressure, time, power and flow rate, absent evidence of disclosure of criticality for the range giving unexpected results are considered to involve routine optimization while has been held to be within the level of ordinary skill in the art. As noted in *In re Aller* 105 USPQ233, 255 (CCPA 1955), the selection of reaction parameters such as temperature and concentration would have been obvious. *See also In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmischer* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sola* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934).

Therefore, the subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to plasma doping method as taught by Lee et al. and suitable plasma doping parameters in the method of Yamamoto and Thakur in order to achieve dopant uniformity.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack Chen whose telephone number is (571)272-1689. The examiner can normally be reached on Monday-Friday (9:00am-6:30pm) alternate Monday off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead can be reached on (571)272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jack Chen
Primary Examiner
Art Unit 2813

April 30, 2006